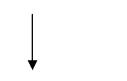| PROCEDURE	NOTES	EXAMPLE

PROCEDURE

Run air dispersion model using an expanded receptor array

↓

Calculate the average concentration of a **generic** VOC over expanded receptor array

↓

Collect a landfill gas sample from the main vent stack

↓

Calculate the average concentration of **each** VOC on the TO-14 list using sample data

↓

Calculate the cancer risk and hazard quotient for each VOC

↓

Calculate the cumulative cancer risk and hazard quotient for the sampling event

↓

Compare cumulative cancer risk and hazard quotient to acceptable levels to determine if an exceedance has occurred

NOTES

- Expanded array will cover "recreational portion" of landfill
- Will employ modeling methods from Recreational Use Evaluation
- Model produces predicted concentration of a generic VOC at multiple locations on landfill
- This modeling would need to be done only **once**

- Average will be calculated by using modeled concentrations at multiple receptor locations to generate a concentration contour map. An area-weighted average will be calculated.
- Average concentration is more representative of actual site exposure to landfill gas than maximum concentration
- We would only need to calculate this average **once**

- Sample will be analyzed for VOCs on TO-14 list

- The predicted VOC concentration produced by the air dispersion model is linear with respect to the concentration emitted by the main vent stack
- The concentration of each specific VOC equals:

$$C_{VOC} = C_{AVG} \times \frac{E_{VOC}}{E_{UNIT}}$$

where C_{VOC} is the average concentration of a specific VOC

- The average concentration of each VOC will be calculated every time a sample is collected. The sample data, combined with the generic average VOC concentration, will be used for calculating specific averages.

- Cancer risk and hazard quotient would be calculated using EPA-approved exposure factors developed for Blackwell and most current available toxicological data

- The cumulative cancer risk is the sum of the cancer risks calculated for all VOCs. The cumulative hazard quotient is calculated in the same manner.

- The cumulative cancer risk must be less than 1×10^{-6}
- The cumulative hazard quotient must be less than 1

EXAMPLE

Generic concentration data from model

Conc (ug/m3)	100	75	50	25
Area (acres)	0.75	2	3.5	3

Calculate area weighted average

$$\text{Average} = \frac{(100 \times 0.75) + (75 \times 2) + (50 \times 3.5) + (25 \times 3)}{(0.75 + 2 + 3.5 + 3)}$$

Average = 51.4 ug/m3

Landfill gas data from sample

Vinyl Chloride =	6,300 ppb
Benzene =	740 ppb

Knowing the 95% UCL flowrate is 41.24 L/s, Evoc is:

Vinyl Chloride = 7.15 E-04 g/s
Benzene = 1.01 E-04 g/s

Using C_{AVG}, E_{VOC}, and E_{UNIT}, calculate C_{VOC}

Vinyl Chloride = 0.03668 ug/m3
Benzene = 0.00518 ug/m3

Now calculate cancer risk and hazard quotient for each:

	Cancer Risk	Hazard Quotient
Vinyl Chloride	1.8 E-09	4.8 E-06
Benzene	2.3 E-10	2.3 E-06
Total	2.03 E-09	7.1 E-06